N.A.C.A. BULLETIN

In Two Sections

Section One

SOME ASPECTS OF OVERHEAD DISTRIBUTION
by RONALD H. ROBNETT 195

"THERE'S NO ACCOUNTING FOR PROFITS"
by WILLIAM H. FRANKLIN 207

DETERMINATION AND DISPOSITION OF RAW MATERIAL PRICE VARIANCES IN A WOOLEN MILL
by CARL W. VON DREELE 215

CONTROL OF MAINTENANCE COSTS
by FREDERICK E. OAKHILL 225

Vol. XXVIII, No. 3 OCTOBER 1, 1946

EDITORIAL DEPARTMENT NOTE

The timely review and reappraisal of accounting methods for the control and application of factory overhead provided by the first article in this issue should be of interest and value to all industrial accountants.

RONALD H. ROBNETT, author of this article, is Associate Professor of Accounting at Massachusetts Institute of Technology, as well as Fiscal Officer of the Institute's Division of Industrial Cooperation. He served as President of the Boston Chapter of N. A. C. A. in 1945-46.

•

Some thought-provoking suggestions for a revision of the conventional form of income statement are provided by our second article, under the intriguing title "There's No Accounting for Profits."

WILLIAM H. FRANKLIN, the author of this article, will be remembered by readers of the *Bulletin* for his earlier article, "Men Were Deceivers Ever," in the issue of September 15, 1944. Mr. Franklin is Controller of the Caterpillar Tractor Co., a Past President of the Peoria Chapter, and a member of the N. A. C. A. Committee on Research.

•

The determination of material price and yield variance can be most important in the processing type of industry, where yield and grade can have an important effect on costs if not controlled. The way in which the North Star Woolen Mill Co. of Minneapolis handles this problem is described in our third article.

CARL W. VON DREELE, Treasurer and Comptroller of the North Star Woolen Mill Co., is the author of this article. Mr. Von Dreele was a New York C.P.A. engaged in public accounting with Ernst & Ernst, and served as specialist in budgets and standard costs with the Manufacturing Division of Marshall Field & Co. before joining his present company three years ago.

•

Our fourth article is a discussion of the problem of controlling maintenance costs and an outline of procedures for obtaining maximum control.

FREDERICK E. OAKHILL, author of this article, is Vice President in charge of Manufacturing of the O'Cedar Corp. of Chicago. Educated in mechanical engineering, business administration, and factory management at the Illinois Institute of Technology and Northwestern University, Mr. Oakhill had had a broad experience in production and maintenance engineering when he joined his present company in 1942.

•

This *Bulletin* is published semimonthly by the National Association of Cost Accountants, 385 Madison Ave., New York 17, N. Y. Subscription price, $10.00 per year. Entered at the Post Office, New York, N. Y., as second-class matter August 28, 1925, under the Act of March 3, 1879.

•

COPYRIGHTED BY THE
NATIONAL ASSOCIATION OF
COST ACCOUNTANTS

OCTOBER 1, 1946

SOME ASPECTS OF OVERHEAD DISTRIBUTION

by RONALD H. ROBNETT,
Associate Professor of Accounting and Fiscal Officer,
Massachusetts Institute of Technology, Cambridge, Mass.

IN TIMES like these, management needs to know everything possible about overhead; what it is, what it does, and how it behaves. Today we are in a period of price confusion, shortages, and a big backlog of demand; tomorrow we will be in a period of the most intense competition. In the last few years production has been a primary goal; the cost of that production a secondary matter.

As we make the transition from war to peace we are beset with many problems. The prices of the men we hire and the things we buy show a persistent and almost irresistible tendency to rise. The productivity of the worker has, in many cases, declined. Management at all levels has a reconversion problem of its own in terms of attitude toward expense controls, standards of performance, and the like. In many companies the postwar program calls for new products, new processes, new plants, and new distribution methods.

The war has greatly accelerated the impact of technological progress and applied research in nearly every industry, and has raised new problems of the relative competitive position as between industries. In one degree or another, every company in every industry faces perplexing problems and challenging opportunities at this very moment. The company which does an outstanding job in the rugged days ahead will excel its rivals in a number of factors. Not the least of these will be its skill in the handling of the diverse and heterogeneous elements of cost which we call overhead. It is a primary problem of management to attain the highest degree of productivity out of its overhead. It is a primary responsibility of cost accountants to see that management does, in fact, understand the characteristics and behavior of overhead costs so that executive decisions may be based on complete knowledge.

For these reasons it seems appropriate to reexamine some of the fundamentals of accounting for overhead. Overhead distribution for purposes of determining unit product costs is an important, but by no means the exclusive, goal of overhead cost analysis. It is of paramount importance, also, that management

be made aware of all facts which will facilitate control at the source of the primary expenses which comprise overhead. These two things are not incompatible nor are they inconsistent.

Cost Characteristics

We know that one of the important objectives of business management is the recovery, through sales, of all the financial outlays made by the business. Every outlay of funds raises at once the question as to whether the value acquired is to be deducted from revenue of the current accounting period or is to be allocated against future revenues. In the case of items to be capitalized there is then raised the problem of choosing the proper bases for apportioning the value over future accounting periods and over the products of those periods.

Total outlay for any given element of cost is influenced greatly by the contractual basis for the purchase of the service. A range of possibilities is available in such purchases. Real estate may be rented at a constant annual price and thus be independent of output, or it may be rented on a basis linked with sales revenue. Machines may be purchased outright, thus creating costs in the form of depreciation, taxes, insurance, and repairs. At least part of these factors have a time basis. Machines may also be leased either on a plain royalty tied to output or on a combination plan of a minimum rental plus a royalty based on units processed. Power is often purchased on combination rates in which the demand factor is independent of use and the consumption factor may be directly variable with use. In these cases, as in numerous other examples which might be cited, the terms of a contract or initial purchase determine not only total outlay, but also whether the cost element is to be "fixed," "wholly variable," or "partially variable." The terms included are presumably the most favorable obtainable, considering the contract as a whole. It is decisions such as these which to a major degree determine the cost characteristics of the business.

Point of Control for Capital Assets

For example, when a machine is purchased many of the cost characteristics pertaining to that machine for its entire useful economic life are determined. At the time of purchase the entire transaction is controllable. In the subsequent accounting periods during which the machine is used, only a portion of the cost

pertaining to it is fully controllable, some of its cost is only partially controllable, and a good deal of its total operating cost is completely noncontrollable.

In accounting for anything less than the entire life of a business enterprise the use of any accounting period, which must be artificial and arbitrary, raises serious problems in overhead cost and profit analysis and determination. Fluctuations in productive activity, traceable to seasonal, cyclical, and random causes, make prorations of long-life assets to periods benefiting from their use a difficult matter. Proration is necessary to cost and profit analysis, but it must nevertheless assume, *as to any one period,* continued future use of all assets for their entire individual lives. Every time the accountant establishes a basis for allocation he makes a decision as to what so-called "use units" will benefit, and over what future period of time or amount of future production the benefit will continue.

Thus, in a particular accounting period, the cost accountant must face the fact that he is dealing with costs which arise in a great many different ways and which have varying degrees of affinity to or remoteness from the products which his company manufactures and distributes. He must recognize that many of his current costs had their origin in financial commitments of several years before. For these he must determine what share of the total cost is to be allocated to the operations of the current period. Of the outlays and commitments which are made currently he must determine also what share belongs to the present and what should be deferred.

Analysis of Income Charges

But his work has just begun. Now that he has formulated his principles for determining how past and present outlays should be charged as between arbitrary interim accounting periods our cost accountant must consider the problem of analyzing these costs in terms of contribution to departments, functions, and products. He must work with his data in such fashion as to establish sound inventory values at all stages in the manufacturing process, and must have reasonable knowledge of the costs of performing various service functions of manufacturing and distribution. He must think through and be prepared to defend his concept of what constitutes the basis of profit for each arbitrary accounting period.

Even this is by no means all. As has been said earlier, some of the costs are not controllable in the current period. Conversely, many of them are. The cost analyst must know what these controllable costs are, must know what major or minor executive is responsible for each of them, and must see that each executive receives prompt, objective, accurate, and easily understood information as to the efficiency with which he is doing his job of expense control. For this function the cost analyst has to get right down to grass roots. He has to know what constitutes a proper standard of performance for each responsibility and be able to report actual performance in such manner as to permit direct comparison with the predetermined goal.

Now this is by no means all that a cost accountant has to do or consider as he faces and solves the problems of overhead analysis, distribution, and control. But it is time for us to dig a little deeper into the problems already raised.

Proration of Long-run Costs Between Accounting Periods

The necessity for interim accounting plus the problems raised by productive activity fluctuations and the presence of fixed cost items raises a difficult problem in cost analysis. The impact of varying levels of production upon fixed cost results in varying unit costs which have little significance in management unless the variations can be attributed to management efforts. Seasonal and cyclical fluctuations result from forces which are, to a considerable extent, noncontrollable by the management of an individual business enterprise. To avoid the difficulties described and to obtain more useful figures cost analysts have disregarded arbitrary accounting periods and have developed the concepts of annual costs to meet the seasonal problem, and of normal costs to meet the cyclical problems. These concepts view the year as more significant in cost analysis than the month, and the cycle as more significant than the year, and prorate fixed costs uniformly to all units of production in the same year or in the same cycle. Results are accomplished by developingg an expense absorption rate based on a typical month in a typical year. By use of this device a portion of outlay in dull periods is shifted to production of peak periods, as representing expense incurred for the benefit of such production but paid out in advance of actual manufacture. The inevitable difference between actual outlay and expense charged to (that is, absorbed by) production is termed under-

absorbed or overabsorbed expense and is allowed to accumulate as a balance in the accounts.

On a strictly logical basis such balances should be permitted to accumulate, in so far as they are due to cyclical conditions, until at the completion of the cycle they finally disappear through cancellation of underabsorption by equivalent overabsorption, or vice versa. In practice this procedure is not followed; instead volume variances are permitted to accumulate only throughout a year and are charged off at the end of the fiscal period. The theoretical error introduced into the financial statement is justified principally on grounds of conservation.

Volume Fluctuations and Unit Product Costs

This approach accepts, on the one hand, the principle that seasonal and cyclical fluctuations should not be permitted to distort the fixed cost component of unit product costs. On the other hand, it is stated that operations traceable to a particular year should be reflected in the financial results of that year. Thus in practice overabsorbed overhead is taken into profit (or shared between profit and a reduction in inventory values), and underabsorbed overhead is taken as an additional expense.

Like most practices in the name of conservatism this one is a compromise and is inconsistent. Those charged with dividend policy and other long-run financial problems have long since learned to ignore the profit results shown by such accounting reports. It is recognized that "profits" due to high volume may be offset, and soon, by "losses" due to low volume.

Further discussion of this broad policy question is inappropriate in this paper, but it is perhaps appropriate to cite this problem as one deserving serious and thoughtful study, with particular reference to the problems of taxation and of labor-management relations. It is one thing to ignore the profits shown by the current published report in establishing dividend policy, and quite another to assert to labor that part of the current high profit shown in the certified published report is not "real" and thus cannot be considered in determining "ability to pay."

However under- or overabsorbed balances may be handled in the annual reports it is seldom that they are permitted to distort unit product costs. The annual and normal concepts, included as they are in the business man's idea of cost, constitute an important qualification to the common idea held by many laymen that unit

product costs as determined in business are in fact so-called "actual" costs. The realistic cost accountant is very much aware of this and knows that while cost analysis may (and does) produce useful unit product costs, it can never under the conditions stated produce so-called "actual" cost.

Proration of Overhead for Product Costing

Proration of overhead for purposes of determining product cost is an important and necessary function. It is, however, in spite of what some of us seem to think, not the end result for which we cost accountants were put upon this earth. Cost analysts must be continually on guard lest the care with which costs are analyzed to produce unit product values lead them to accept these costs for other than what they are—approximations for a particular purpose. For inventory purposes, that is for comparison with sales prices, unit product costs are a must. For purposes of analyzing and controlling overhead expense, of determining the efficiency of a department or process, of deciding whether to add or drop a product or line or territory, unit product costs, as we all know, are a snare and a delusion.

In the predetermination of product overhead rates there are several desirable and familiar steps:

1. Classification of primary expenses.
2. Analysis of these expenses by contribution to operating departments, both service and producing.
3. Redistribution of service department costs in a manner finally to bring all costs to the door of producing departments or burden centers.
4. Determination of overhead rates for purposes of product costing.

Classification of Primary Expenses

When we decide how the primary expenses will be classified and establish the chart of accounts therefor, we are in effect predetermining the nature and direction of much of our subsequent cost accumulation and analyzing activity. For this reason there must remain clearly in mind at least two functions of cost analysis.

1. The determination of unit costs of products for use in inventory valuation, pricing, and profit determination, and
2. The providing of data needed for cost control.

With a clumsy account classification one could still establish satisfactory unit costs; but without an intelligently planned and adequate group of accounts control through cost analysis is virtually impossible. There are a number of approaches to the problems of account classification, but the one which most nearly meets the above requirements is classification by executive responsibility. Thus the accounts should be fitted to the organization chart so that costs can be segregated by individual responsibilities. Related to each responsibility the detailed accounts should be subdivided under uniform classifications to show the nature of expenditures.

This approach makes possible an important next step which is a logical companion of the first; the determination of proper standards of performance. This is a job for the production executive, the engineer, and the accountant working as a team. It involves analysis of the past and forecast of the future. It requires an intimate knowledge of the manufacturing processes and a complete meeting of the minds as to goals, standards, and terminology. As Clinton Bennett has so aptly phrased it,[1] "The figure-minded man will sit down and set up his budget in terms of dollars and cents, and having done that, he will attempt to convert it into things. The practical man starts with things and converts those things into dollars and cents. Actually it is a combination job, but the first fundamental step is that we must start with tangible things—numbers of people, pounds of material, available manufacturing capacity—and work from there into figures."

Why this emphasis on standards in a discussion of overhead distribution? There are two reasons. We are talking about *predetermination* of rates in which, among other things, we are interested in what the costs *should* be as well as in what they *will* be. We also have one eye at all times cocked on the cost accountant's great responsibility and opportunity in the matter of control of overhead expense.

Analysis of Costs by Contribution to Operating Departments

In approaching the problem of analysis of costs by operating departments at least two points should be borne in mind:

[1] *Anniversary Papers,* Regional Cost Conference, Buffalo, New York, November 4, 1944. National Association of Cost Accountants, 1945.

1. If primary expenses are classified by responsibility, a portion of the costs of each operating department already will be known. There remains only the proration of costs arising from outside the operating departments.
2. The principal value in prorating costs to service departments lies in the knowledge thus gained of total operating costs of such departments and their ultimate bearing on the costs of manufacturing the company products. There is little or no short-run operating control value in such prorations.

From the long-run point of view there may be control advantages in knowing total prorated costs of the service departments. Such knowledge may be helpful in making possible judgments on such matters as whether to manufacture or purchase power, to operate a medical department or contract for medical service, to operate a restaurant or make an arrangement with a concessionaire, and the like.

In the short run the prorations which we make consist largely of items and amounts the nature of which was determined in an earlier accounting period at the time of the financial outlay. They are real costs. They must be measured and doubtless should be prorated for purposes of product costs, but in the short run they are beyond the immediate control of management.

Redistribution of Service Department Costs

There has been much discussion of the problem of redistribution of service department costs. The literature includes numerous references, among which are some which go to the extreme of suggesting the use of simultaneous equations to solve the dilemma of reciprocal contributions by service departments. To be sure, in some such cases it is pointed out that the use of simultaneous equations is not *entirely* practicable where there are more than three reciprocal transfers of interdepartmental service expenses.

Actually one has to strain pretty hard even to begin to make a case for precise and refined mathematical methods in the distribution of service department costs. The tool should be fitted to the task. A prorated cost is at best approximate information. It can and does lead to useful unit product costs but it will never give us precise and absolute so-called "actual" costs. No amount of refinement in the intermediate processes will change the nature

of the original data. This is not something for which cost accountants should apologize. Rather, because accountants know the strengths and limitations of cost data better than any other group in management their attention should be focused on guiding others in the correct interpretation of the elements which, when combined, comprise unit product cost.

Perhaps it has become clear that the writer leans well to the left of center on this matter of redistribution of service department costs and can see no justification for reciprocal distribution whether by the methods of simultaneous equations, so-called "continued" distribution, or trial and error. There is real merit, of course, in the method of nonreciprocal distribution which involves analyzing successively those departments which most serve others and which are in turn least served.

Likewise, there is much justification for the more unorthodox approach of those companies which analyze service departments in terms of their contribution to burden centers without reference to the relationship of service departments to each other. The point of view of those who advocate this approach assumes:

1. Substantial saving in effort because of relative simplicity.
2. No traceable distortion of product costs.
3. Avoidance of more confused mixture of interdepartmental expenses resulting from other methods.
4. Ease of analysis of service department costs in terms of controllable expenses and prorated primary expenses.

From the viewpoint of the teacher of cost accounting there is, of course, one obvious disadvantage in this simplified method. Wholehearted adoption of this philosophy would remove from the classroom one of the more rigorous intellectual disciplines that has plagued the lives of students from time immemorial. On the other hand its omission would create time in a crowded program for equally vigorous and much more fruitful disciplines in the areas of analysis and interpretation for control.

Determination of Overhead Rates

In our task of predetermining overhead rates the prorated expenses have now been brought to the door of the burden center. Those primary expenses which were determined to be under the direct responsibility of the supervisory executive in charge of the producing center were assigned there directly.

We must now combine these items under a rate which, when applied to the production going through the center, will most nearly represent the contribution of these expenses to the individual units of production. At this point we must be reminded that this rate will be designed to recover, among others, the following kinds of costs:

1. Those costs which are the direct responsibility of the supervisor, some of which should be
   a. Directly variable with production,
   b. Partially variable with production, and
   c. Constant (at least within agreed limits of production).
2. Those costs which are (or, in some cases, *were* at the time of outlay) the responsibility of some executive other than the supervisor. These also will include variable, semi-variable, and constant costs.

This is really a heterogenous mixture of things to bring together into one rate, which when adopted will find its way into product costs, into the balance sheet, into the profit and loss statement, and into considerations of management policy in measuring sales prices and a variety of other matters. A number of considerations are raised.

First is the question of selection of a burden center. We will ignore the possibility of setting one burden rate for the entire plant, for if we believed in that approach we would have no problem of overhead distribution. The next possibility is the producing department, but the most modern practice is to go below the producing department if there exist within it substantial differences in machine investment, product routing, or process. The problem is to seek a balance between relative simplicity and relative accuracy; a problem, after all, to be solved in terms of the individual situation. A large and diversified operating department could well be treated as one burden center if all products flowed over all types of machines in a reasonably constant ratio. It clearly should be subdivided if this situation does not prevail.

A second consideration involves a decision as to the operating level. We discussed earlier the problem of normal production and the effects of seasonal and cyclical fluctuation. The problem of determining the practical capacity both to make and to sell is not an easy one and includes the problem of balance between machines and departments. The practical operating level in one center may be

2,000 hours and, in order to achieve balanced output, may be only 1,000 hours in another center. It may be the normal thing for a fruit packing plant to be extremely busy for two months and shut down entirely for ten months. A realistic approach to this program will help to achieve realistic costs.

The third consideration is the selection of the denominator in the overhead rate formula. It may be helpful to review the principles which might be applicable in choosing the right method for a particular burden center.

1. The most common characteristic of the heterogeneous group of expenses which comprise overhead is time. Everything being approximately equal, the product which occupies the resources of the burden center two hours should be charged four times the amount allocated to the product which is in process 30 minutes. A rate expressed in hours meets this point.
2. The next question is whether a man-hour rate or a machine-hour rate is the more appropriate. In most cases the answer may be readily apparent. If the worker is the principal force in production, as in bench work, a labor-hour rate is the better basis for burden distribution. If the machine dominates the activity of the burden center, with labor playing a subordinate role or divided among a number of machines, the situation calls for a machine-hour rate as more reasonably and accurately reflecting the facts.
3. The labor-dollar rate would be as accurate as an hourly rate only under conditions of uniform or directly proportionate hourly earnings. Otherwise distortions would develop which would result in inequitably measuring time spent on production. It has the advantage of simplicity but no other.

Periodic Distributions of Overhead

In our discussion of overhead distribution we have so far limited ourselves to analysis for the purpose of setting rates, the predetermination of overhead. There is raised the question of the subsequent periodic distribution of actual overhead expense for purposes of comparison with rates set. This is an onerous and expensive process and little information of control or analysis value will result therefrom. The proration of actual expense

through the distribution cycle would, of course, reveal differences between actual conditions for the month in question and the results of the conditions assumed when the rate was set.

But to get at the root of the difficulty, it would be necessary to go back to the primary expense and to the executive responsible for it. Thus comparison of the actual primary expense with the budgeted primary expense is the thing of value. It is at this point that the wise selection of the chart of accounts begins to pay off. If we accept the proposition that inventory values would not be changed with each fluctuation in volume or with each random expense inefficiency, then we agree that our chief concern with overhead during the operating period is in the area of expense control.

Control of Expense

It is in this area of control of overhead expense that the cost accountant has his great opportunity and responsibility in giving qualitative service to management. His thorough understanding of the components and characteristics of overhead expense and of the nature of and responsibility for the financial outlays which give rise to the expense places him in a unique position.

Through his skill in devising account classifications which measure expenses in terms of responsibility, his knowledge of the behavior of costs under various volume conditions, and his general understanding of the operating problems of the business, the cost accountant becomes an important member of the management team in establishing standards of performance, in devising procedures for presenting objectives in clear and understandable form, and in compiling results of actual performance in a way which facilitates prompt control action. He knows that it is *men* who control, and not figure analyses. He knows that they control in terms of human responsibility. He has real satisfaction in the knowledge that the line executive is enabled to take constructive and intelligent action based upon his qualitative analysis and interpretation of the company's overhead facts. This is service to management of a high order.

"THERE'S NO ACCOUNTING FOR PROFITS"*

by WILLIAM H. FRANKLIN, Controller,
Caterpillar Tractor Co., Peoria, Ill.

THE so-called statement of profit and loss is at long last under scrutiny, and many experiments have been begun in new methods of presentation which will portray the results of business operations in a more informative fashion than the traditional form of statement. In this paper is presented an experiment in a wholly new form under way at Caterpillar Tractor Company which has progressed sufficiently far as to justify belief that the form, while unquestionably subject to further improvement, is a decided improvement upon any form previously in use at that company.

Accountants are by nature and by training conservative, and in most respects it is well that they remain so. Conservatism, however, tends to create a resistance to change to the extent that often the accountant is far behind times and as a result a good bit of his effectiveness is lost. We must progress slowly, but progress we must, and it is high time that the traditional form of profit and loss statement be discarded as obsolete.

Financial Accounting and Inventory Valuation

In its early development accounting was designed primarily for the purpose of recording the financial transactions of a business in such a manner as to present a financial history of that business. Accountants were concerned, therefore, with each event from the viewpoint of the effect of that event upon the historical record under compilation. One of the major problems from this viewpoint was, and still is, the determination of the proper costs to be carried to inventory until such time as the inventory is sold, and the proper costs to be carried immediately to the profit and loss statement. It was only natural, therefore, that the statement of profit and loss developed in a form to show sales, cost of goods sold, and gross profit on sales from which are deducted those costs not carried to inventory,—selling and general and administrative expenses,—to arrive at operating profit. This is a form of statement particularly suitable for its original purpose.

---

* "There's no accounting for tastes," said the old lady as she kissed the cow.—Old saw.

In this paper a "sacred cow" is "kissed."

STATEMENT OF PROFIT AND LOSS

June 1946

EXHIBIT 1

	June		May		April		Year to date		Previous year to date	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
Sales	$4,844,000	100.00%	$4,698,000	100.00%	$4,509,000	100.00%	$24,350,000	100.00%	$19,415,000	100.00%
Cost of goods sold	3,810,000	78.65	3,552,000	75.61	3,434,000	76.16	18,565,000	76.24	14,490,000	74.63
Gross profit	$1,034,000	21.35	$1,146,000	24.39%	$1,075,000	23.84%	$ 5,785,000	23.76%	$ 4,925,000	25.37%
Selling, general and administrative expense:										
Wages and salaries	$ 70,000	1.45%	$ 65,000	1.38%	$ 65,000	1.44%	$ 385,000	1.58%	$ 265,000	1.37%
Supplies	170,000	3.51	75,000	1.60	78,000	1.73	550,000	2.26	450,000	2.31
Depreciation	10,000	.21	10,000	.21	10,000	.22	60,000	.25	56,000	.29
Insurance	2,000	.04	2,000	.05	2,000	.05	12,000	.05	11,000	.06
Taxes other than federal income taxes	6,000	.12	6,000	.13	5,000	.11	34,000	.14	32,000	.16
Miscellaneous	42,000	.87	42,000	.89	45.000	1.00	234,000	.96	211,000	1.09
	$ 300,000	6.20%	$ 200,000	4.26%	$ 205.000	4.55%	$ 1,275,000	5.24%	$ 1,025,000	5.28%
Operating profit	$ 734,000	15.15%	$ 946,000	20.13%	$ 870,000	19.29%	$ 4,510,000	18.52%	$ 3,900,000	20.09%
Other income or (expense):										
Interest earned	$ 10,000	.21%	$ 10,000	.22%	$ 10,000	.22%	60,000	.25%	-	
Interest paid	-		-		-		-		$ (30,000)	(.15)%
Miscellaneous	1,000	.02	2,000	.04	1,000	.02	7,000	.03	7,000	.03
	$ 11,000	.23%	$ 12,000	.26%	$ 11,000	.24%	$ 67,000	.28%	$ (23,000)	(.12)%
Profit before deducting federal income taxes	$ 745,000	15.38%	$ 958,000	20.39%	$ 881,000	19.53%	$ 4,577,000	18.80%	$ 3,877,000	19.97%
Federal income taxes	283,100	5.84	364,040	7.75	334,780	7.42	1,739,260	7.15	1,550,800	7,99
Profit	$ 461,900	9.54%	$ 593,960	12.64%	$ 546,220	12.11%	$ 2,837,740	11.65%	$ 2,326,200	11.98%

Presenting Result to Public

The use of accounting figures has, however, progressed far beyond the purpose of recording historical events. At present there are at least two main fields in which accounting figures are used over and above the original primary use: (1) in presenting to the public the economics of business, and (2) in presenting to the managers the details of operations in order to help them understand trends and movements.

The problem of presenting to the public the economics of business is a subject of vast importance, but this paper can only treat with it in passing. Spearheaded by United States Steel Corporation, the trend appears to be to treat the profit and loss statement as a statement of who got what from the operations of the business. From sales (or "payments by customers," etc.) are deducted costs divided into such captions as materials and supplies, wages, taxes, etc., to arrive at profit ("left for owners," etc.) from which are deducted dividends to obtain the profits retained in the business ("amount carried forward," etc.).

Conventional Executives' Reports

This paper is concerned, however, with the problem of presenting to the managers of a business the details of operations of that business in such a manner as to help them understand the trends and movements occurring in that business. For this purpose the traditional form of profit and loss statement is still very largely in use. Let us examine the effectiveness of this statement when put to this purpose.

Exhibit 1 presents the statement of profit and loss of a fictitious company for the month of June, 1946. It shows the results for June compared with May and April and the results for the year to date compared with the results for the previous year to date. Sales, we find, have been climbing steadily but cost of sales (and therefore gross profit) has been performing most erratically, shifting from 76.16 per cent in April, to 75.61 per cent in May, to 78.65 per cent in June. Why? From the statement we have no idea to what extent these changes were the result of changes in type of items sold, in sales prices, or in costs. Furthermore, selling and general administrative expense jumped $100,000 in June mainly because supplies jumped $95,000, but "supplies" covers a multitude of items and we are still in the dark. I can only say in the language of the title; "there's no accounting for profits."

STATEMENT OF OPERATIONS

June 1946

EXHIBIT 2

	June		May		April		Year to date		Previous year to date	
	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent	Amount	Percent
Sales:										
At dealers' net prices	$5,000,000	100.00%	$4,800,000	100.00%	$4,600,000	100.00%	$25,000,000	100.00%	$20,000,000	100.00%
Variances:										
Cash discounts allowed	$ 90,000	1.80%	$ 85,000	1.77%	$ 80,000	1.74%	$ 500,000	2.00%	$ 410,000	2.04%
Government discount	10,000	.20	10,000	.21	5,000	.11	65,000	.26	150,000	.75
Other discount	51,000	1.02	2,000	.05	1,000	.02	57,000	.23	5,000	.03
Replacements	5,000	.10	5,000	.10	5,000	.11	28,000	.11	20,000	.10
	$ 156,000	3.12%	$ 102,000	2.13%	$ 91,000	1.98%	$ 650,000	2.60%	$ 585,000	2.92%
Net sales	$4,844,000	96.88%	$4,698,000	97.87%	$4,509,000	98.02%	$24,350,000	97.40%	$19,415,000	97.08%
Costs:										
Manufacturing cost of sales—at standard	$3,500,000	70.00%	$3,360,000	70.00%	$3,320,000	72.17%	$17,600,000	70.40%	$14,000,000	70.00%
Variances:										
Material	$ 100,000	2.00%	$ 80,000	1.67%	$ 60,000	1.30%	$ 350,000	1.40%	$ 150,000	.76%
Cash discount earned	(30,000)	(.60)	(28,000)	(.58)	(26,000)	(.57)	(150,000)	(.60)	(135,000)	(.68)
Direct labor	40,000	.80	40,000	.83	35,000	.77	240,000	.96	200,000	1.00
	$ 110,000	2.20%	$ 92,000	1.92%	$ 69,000	1.50%	$ 440,000	1.76%	$ 215,000	1.08%
Expenses:										
Accounting	$ 50,000	1.00%	$ 45,000	.94%	$ 45,000	.98%	$ 270,000	1.08%	$ 275,000	1.38%
Administrative	50,000	1.00	50,000	1.04	50,000	1.09	300,000	1.20	300,000	1.50
Advertising	100,000	2.00	10,000	.21	10,000	.22	150,000	.60	50,000	.25
Engineering	50,000	1.00	35,000	.73	50,000	1.09	300,000	1.20	50,000	.25
Industrial relations	30,000	.60	25,000	.52	25,000	.54	160,000	.64	150,000	.75
Manufacturing	1,550,000	31.00	1,490,000	31.04	1,250,000	27.16	7,950,000	31.80	5,700,000	28.49
Purchasing	20,000	.40	15,000	.32	15,000	.33	90,000	.36	180,000	.90
Sales	60,000	1.20	41,000	.85	43,000	.93	245,000	.98	100,000	.50
Expenses not allocated to departments:										
Depreciation	50,000	1.00	50,000	1.04	50,000	1.09	300,000	1.20	280,000	1.40
Insurance	10,000	.20	10,000	.21	10,000	.22	60,000	.24	55,000	.28
Taxes—other than federal income taxes	30,000	.60	29,000	.60	27,000	.59	175,000	.70	160,000	.80
	$2,000,000	40.00%	$1,800,000	37.50%	$1,575,000	34.24%	$10,000,000	40.00%	$ 7,300,000	36.50%
Less—Expenses absorbed in inventory	1,500,000	30.00	1,500,000	31.25	1,325,000	28.80	8,200,000	32.80	6,000,000	30.00
Expenses not absorbed in inventory	$ 500,000	10.00%	$ 300,000	6.25%	$ 250,000	5.44%	$ 1,800,000	7.20%	$ 1,300,000	6.50%
Net costs	$4,110,000	82.20%	$3,752,000	78.17%	$3,639,000	79.11%	$19,840,000	79.36%	$15,515,000	77.58%
Operating profit	$ 734,000	14.68%	$ 946,000	19.70%	$ 870,000	18.91%	$ 4,510,000	18.04%	$ 3,900,000	19.50%
Other income or (expense):										
Interest earned	$ 10,000	.20%	$ 10,000	.21%	$ 10,000	.22%	$ 60,000	.24%	–	– %
Interest paid	–	–	–	–	–	–	–	–	(30,000)	(.15)
Miscellaneous	1,000	.02	2,000	.04	1,000	.02	7,000	.03	7,000	.03
	$ 11,000	.22%	$ 12,000	.25%	$ 11,000	.24%	$ 67,000	.27%	$ (23,000)	(.12)%
Profit before deducting federal income taxes	$ 745,000	14.90%	$ 958,000	19.95%	$ 881,000	19.15%	$ 4,577,000	18.31%	$ 3,877,000	19.38%
Federal income taxes	283,100	5.66	364,040	7.58	334,780	7.28	1,739,260	6.96	1,550,800	7.75
Profit	$ 461,900	9.24%	$ 593,960	12.37%	$ 546,220	11.87%	$ 2,837,740	11.35%	$ 2,326,200	11.63%

Limitations of Conventional Treatment

An analysis of the weaknesses of the traditional form of statement will help point the way to a better statement. Sales are shown as one figure, representing the amount billed for the products shipped and services rendered during the period. In order to compare intelligently one period with another, however, the reader must know the effect of volume and the effect of price, and these are not segregated. Almost all businesses today have a standard sales price for their products, but frequently adjustments are made in these prices for trade or cash discounts, for obsolete or damaged goods, etc. It is necessary, therefore, to present not one figure, "net sales," but a series of figures; first, sales at standard sales price, and then sales variances analyzed by types. With this manner of presentation, a comparison of sales at standard sales price will give a true indication of changes in volume. In those infrequent instances where changes are made in standard sales prices, the standard sales price can be changed or possibly a new sales variance account can be opened to show the effect of the changes in sales price. Further, a comparison of sales variances will give a clear picture of the trend of discounts and replacements.

In the traditional form, cost of goods sold is shown in one figure and no disclosure is made of changes in cost levels. If a company is operating with a standard cost system, it is a simple matter to present separately the cost of goods sold at standard cost and the various cost variances. Fluctuations in cost variances give, then, a picture of fluctuations in cost levels.

Weakness in Division of Costs

The most fundamental weakness, however, of the traditional form is its obsession with the differentiation between costs to manufacture on the one hand and costs to administer and sell on the other hand. A quick look at the organizational structure of most businesses will demonstrate that in actual operation this differentiation is quite fictitious. The accounting department of a manufacturing concern, for example, is in part concerned with manufacturing operations (compilation of factory payroll and costs, etc.) and in part concerned with administration (general ledger, financial statements, etc.), and yet the controller is held responsible by his superiors for all expenditures made by his department without regard to their accounting classification. The same can be said for such other departments as purchasing, industrial

relations, etc. In many cases even the manufacturing department is in part concerned with selling and administrative expenses, at least to the extent that it furnishes watchmen, janitors, and maintenance for office buildings.

A statement of profit and loss presented to the managers of a business should follow the thinking of these managers in setting up the organization. Accounting department expense, for example, should not be so allocated between manufacturing costs and administrative costs as to require reassembly of the pieces before anyone can examine the total expenditures. The statement should, therefore, list the expenditures by departments without regard to the function of each department. From the grand total can be deducted the expenses absorbed in inventory to obtain the expenses not absorbed in inventory, a combination of so-called over- or underabsorbed burden and of selling, general, and administrative expense.

This manner of presentation also provides for disclosure of the very significant figure: expenses not absorbed in inventory. If this absorption is calculated at a standard burden rate applied to standard direct labor, as is usually the case, then any change in the amount absorbed is the sole result of a change in manufacturing activity. It is possible, therefore, to determine changes in manufacturing activity as distinct from changes in sales activity, an important distinction not disclosed in the traditional form of statement.

Revised Form

A form is presented in Exhibit 2 which is patterned after the form in use at Caterpillar Tractor Company. The same operating results are used as in Exhibit 1 and any resemblance to any figures living or dead is purely coincidental. This form shows sales first at dealers' net prices, the standard in this particular instance. From such standard are deducted the sales variances; cash discount allowed, government discount, other discount, and replacements. The second section presents the costs: first, manufacturing cost of sales at standard and cost variances; next, the various expenses listed by departments together with certain expenses beyond the control of each department head and, therefore, not allocated by departments. From the total expenses are deducted the expenses absorbed in inventory to arrive at expenses not absorbed in inventory.

It must be admitted that a single statement cannot explain all the manifold happenings in a business period. At best it can only serve to guide the reader to asking the pertinent questions, if he does not already know the answers. Let us examine Exhibit 2 for this fictitious company to see if it helps us to ask the proper questions.

Answers Provided by Revised Statement

Sales at dealers' net prices (the standard) show a steady increase from April through June and the year to date shows a decided increase over the previous year to date. This increase indicates (unless adjustments in the standard sales prices occurred) that volume has increased. This increase in volume has been accomplished by increases in cash discount allowed. Government discount increased in May and June as compared with April, but the year to date is considerably below the previous year to date, which is not surprising since 1946 is being compared with 1945. Other discount, however, is $51,000 in June compared with only $2,000 in May and here we have our first question: Why? This loss in sales price would be buried in the traditional form of statement, unless gross sales and sales discounts were disclosed.

Turning to the cost section of the statement, we find that manufacturing cost of sales at standard has, of course, increased with the increase in volume. Here the percentage is of more significance. Since sales at dealers' net price is unchanged and manufacturing cost of sales at standard is unchanged, the percentage of one to the other should remain unchanged. This was 70.00 per cent in June and May but in April it was 72.17 per cent. The only possible explanation of this higher percentage is a change in mix of products, and we conclude that in April our mix was less profitable than in May and June. This, of course, can be readily verified by reference to the product sales analysis.

Material cost variance has increased each month and the dollar increase has been greater than the increase in volume, as evidenced by an increase in the percentage of this item to sales at dealers' net prices. The conclusion is, then, that material costs have increased. Direct labor variance also increased in May as compared to April, leading to the conclusion that a change occurred at that point either in efficiency or wage rates.

The most significant change in the departmental expenses was in the expenditures of the advertising department, which jumped

from $10,000 in April and May to $100,000 in June. (This increase is probably the reason "supplies" jumped in Exhibit 1.) For the cause of this increase the advertising manager or the expense statement of the advertising department can, of course, be consulted.

The increase in manufacturing department expense can best be judged by comparison with the amount of expenses absorbed in inventory. As mentioned previously, this latter figure is calculated at a standard burden rate and is a good index to manufacturing activity. Thus, manufacturing activity jumped from $1,325,000 in April to $1,500,000 in May, an increase of approximately 13 per cent; whereas, the expenditures of the manufacturing department in the same period increased from $1,250,000 to $1,490,000, an increase of approximately 19 per cent. Furthermore, in June with no more manufacturing activity than in May, the expenditures of the manufacturing department increased still further to $1,550,000.

Summary

This brief analysis of the operations of a fictitious company is sufficient, perhaps, to illustrate the additional information conveyed to the reader by the new form of statement. In actual practice the form must be adapted to suit the paricular case. One company will have many more types of sales variances than another, cost variances are analyzed more completely in one case than in another, and the number and types of departments will vary. But in all cases the fundamentals are the same. There is a standardized sales price; under a standard cost system there are standard costs of sales and cost variances; and the organization is departmentalized.

The form of statement here presented is not, of course, usable for determination of the proper costs to be carried to inventory, a determination which must be made. This problem, however, is uniquely the problem of the accountant and not of the managers of the business. Moreover, the information can be readily obtained on work sheets by allocating each department's expense between manufacturing cost and selling, general, and administrative expense.

This form is admittedly in the experimental stage and the writer would appreciate discussion of it to the end that a good form for control purposes shall be developed.

DETERMINATION AND DISPOSITION OF RAW MATERIAL PRICE VARIANCES IN A WOOLEN MILL

by CARL W. VON DREELE, Treasurer and Comptroller,
North Star Woolen Mill Co., Minneapolis, Minn.

WHILE the title of this paper seemingly limits its scope to a woolen mill, the ideas and techniques presented can probably be adapted to other industries. It is recognized that even in the same industry conditions in individual plants vary widely, so that the records necessarily differ. Nevertheless, accountants like to believe, and are probably right in believing, that the basic principles of cost accounting remain the same regardless of the type of industry or conditions in individual plants.

Before explaining the methods of determination and disposition of raw material price variances at the North Star Woolen Mill Company, some background information is necessary. North Star manufactures a line of all-wool blankets and woolen cloth for the department store trade and special outlets. The raw material, wool, comprises, about 70 per cent of the manufacturing cost of the finished product, and hence, wool price variations of only a few cents per pound can amount to a considerable sum.

Wools purchased include both grease and scoured wool. The former requires scouring to remove the natural grease and foreign matter, while the latter may be introduced directly into the first stage of yarn manufacture called "picking." The other stages of yarn manufacture are "carding" and "spinning." The yarn from spinning is woven into cloth on the looms. This is followed by the various finishing operations which produce either the blanket or cloth. In some cases the woven piece is dyed, while in others the scoured wool is dyed before picking for manufacture into yarns.

Blending Wool

Many different grades of wool are used in the various products. In most cases there are two or more different grades blended together in the same product. The selection of wool grade depends entirely upon the type of blanket or cloth desired. Once the proper blend is established it is fairly closely adhered to. However, some variations are possible without affecting the quality of the product so that, as a practical matter, the blends are changed

from time to time within a limited range depending upon the available stock. These variations in blend result in "blend variances" from standard, which will be covered along with the explanation of price variances.

Standard Product Specifications

Standard specifications are set for each product quality giving the blend, stock dye content, if any, and other details necessary for the determination of the standard cost. Grease wools vary widely as to clean yield which is usually taken into account in negotiating purchase prices. Therefore, the wool in the standard specifications is always stated on a clean or scoured basis so that the purchase price variance could not be determined until the wool is scoured. In our accounting we delay this determination until the wool is picked. At that time the yarn to be manufactured is known and, since there is little duplication of yarns as between our product classifications of "regular blankets," "contract blankets," and "cloth," the price variances can be accurately allocated to these classifications. Where the same yarn is used in products of two or more of these classifications, reference is made to the weaving production in the same month and the variance for the yarn involved is allocated in proportion to the content of that yarn in the goods woven.

Consequently, the wool inventories are carried on the books at actual cost, rather than at standard cost. Scoured wool costs include the cost of scouring on a standard basis if originally purcased in the grease, while stock dyed wools include the standard dyeing cost as well. These standard scouring and stock dye costs are absorbed as the processing is done, with the difference between these standard amounts and actual costs being reflected in labor and burden variance accounts. Usage of soaps, dyes, and chemicals is determined on a standard basis so that there is no variance to record at the time of processing. Variances in these manufacturing supplies will, of course, be reflected in the semiannual physical inventory differences, but have not proved to be of sufficient importance to justify more complicated methods.

Raw Material Record

A raw material record book of wool inventories is kept by the cost department, on a perpetual inventory basis in both pounds and dollar values. Separate sheets are provided for each lot of wool,

identified by the vendor's lot number. This identity is maintained through the scouring and stock dyeing operations. Exhibit 1 shows a sample page from this record and illustrates our method of averaging prices through the use of the last column on the right-hand side of the sheet. The figure in this and in succeeding illustrations are, of course, entirely hypothetical. This book has three sections with a control sheet for each, tieing in with the general ledger accounts for grease wool, scoured wool, and stock dyed wool.

Wool purchases, freight, and other charges are posted from invoices to the grease wool or scoured wool record sheets, as the case may be. Scouring reports are summarized monthly by lot numbers and listed on a work sheet which is headed as follows:

SCOURING COSTS

Lot	*Wool Used*			*Pounds*	*Std. Labor, Burden, and Mfg. Supplies*		*Total Production*
No.	*Pounds*	*Price*	*Amount*	*Produced*	*Price*	*Amount*	*Cost*

The price of wool used is secured by reference to the raw material record. Separate figures for standard labor, burden, and manufacturing supplies (soap and chemicals) can be obtained from the combined total by proportion. This work sheet provides totals for the general ledger journal entry as well as the figures for each lot for posting the usage to the grease wool record sheets and scoured production to the scoured wool record sheets. Stock dyeing is recorded in a similar manner with the same type of work sheet.

Determination of Price and Blend Variances

Picking reports from the mill are received daily by the cost department for each blend lot, showing the pounds of wool used by lot numbers and the yarn number for which the batch was laid out. These reports are tabulated on record sheets for convenient summary at the month end. Monthly totals are entered on work sheets similar to that shown as Exhibit 2.

Actual cost prices for the wool used are obtained by reference to the raw material record for scoured wool (white) or stock dyed wool (S. D.), as the case may be. The pounds used and amounts of actual cost are summarized from this work sheet by lot numbers for convenience in posting the credits to individual sheets in the raw material record.

Price variances, computed on this work sheet, are the differences

RAW MATERIAL RECORD

Inventory Account—161 Grease Wool

Vendor—John Doe Company

Location—Minneapolis

Grade 200

Lot No. 2099

Date 1946	Explanation	Ref.	Debit Pounds	Debit Amount	Credit Pounds	Credit Amount	Balance Pounds	Balance Amount	Av. Cost Per Pound
Jan. 9	Wool	V1019	100,000	$50,000.00					
15	Freight	V1072		250.00			100,000	$50,250.00	$.5025
31	To Scouring	J 12			75,000	$37,687.50	25,000	12,562.50	.5025
Feb. 12	Wool	V2050	50,000	26,000.00			75,000	38,562.50	
20	Freight	V2095		125.00			75,000	38,687.50	.5158
28	To Scouring	J 12			50,000	25,790.00	25,000	12,897.50	.5159
Mar. 31	To Scouring	J 12			25,000	12,897.50	—0—	—0—	

EXHIBIT 1

PRICE AND BLEND VARIANCES

April, 1946

Yarn No.	*Wool Lot No.*	*Grade*	*Pounds Used*	*Actual Cost Price*	*Actual Cost Amount*	*Std. Wool Cost Price*	*Std. Wool Cost Amount*	*Price Variance*	*Std. Blend Cost Price*	*Std. Blend Cost Amount*	*Blend Variance*	*Total Variance*	*Mdse. Class*
100	232 wh	100	500½	$ .9502	$ 475.58	$1.00	$ 500.50	$ 24.92					
	722 SD	120	752	1.1611	873.15	1.15	864.80	[8.35]					
	601 SD	122	807½	1.1802	953.01	1.20	969.00	15.99					
			2,060		$ 2,301.74		$ 2,334.30	$ 32.56	$1.051	$ 2,165.06	[$134.74]	[$102.18]	Reg.
105	232 wh	100	11,202	$ .9502	$10,644.14	$1.00	$11,202.00	$ 557.86					
	509 wh	125	15,600	1.0211	15,928.96	1.05	16,380.00	451.04					
			26,802		$26,573.10		$27,582.00	$1,008.90	1.025	27,472.05	[109.95]	989.95	Cloth

(Brackets denote red figures)

EXHIBIT 2

between actual wool cost and standard wool cost for each grade. The standard proportions of the grades of wool for each yarn number are reflected in the standard blend cost so that the difference between this and standard wool cost is the blend variance, i.e., due to change from standard blend. The totals of this work sheet provide figures for the general ledger journal entry which is in the following form:

Work in Process (standard blend cost)..	xx	
Scoured Wool (actual cost).....		xx
Stock Dyed Wool (actual cost).....		xx
Price Variance Reserve (total variance)		xx
Regular Blankets		
Contract Blankets		
Cloth		

The details of the credit to the Price Variance Reserve by merchandise classifications is carried in columns in the ledger account. This reserve includes both price and blend variances without segregation and the combined amounts are referred to in the remainder of this paper as simply "price variance" rather than the more unwieldly title of "price and blend variance." For report purposes, this simplified title is also used to indicate the combined figures except in one instance where separate figures for each are reported.

Raw Material Content of Inventories

Price variances are retained in the Price Variance Reserve account until the goods represented by the variances are sold. With a continuous process such as we have at North Star it is not possible to identify individual blankets or pieces of cloth with particular lots of wool put into process at the pickers. Neither is it, therefore, possible to identify price variances on wool lots with individual blankets or pieces of cloth. Consequently, we use a theoretical method to determine which price variances no longer are applicable to inventory and, therefore, should be written off as a reduction of current cost of sales. I say reduction because our standard wool prices are usually set at a conservative level above expected costs so that the price variances are generally favorable and ultimately reflect as credits to cost of sales.

The first step in the theoretical method of disposition of price variances is the determination of raw material content of the

inventory. This is calculated from the standard cost budget, i.e., the basis of standard costs. With relatively few finished styles we can and do prepare the standard cost budget completely, including wool and manufacturing supplies as well as the usual items of direct labor and burden. The raw material content percentage for finished goods is simply the amount of wool in the budget divided by the total budget. For work-in-process accounts the procedure is somewhat more complicated. We complicate the matter still further by having three work-in-process accounts:

1. Yarn Manufacturing
2. Yarns
3. Blanket and Cloth Manufacturing

The first account covers the picking, carding, and spinning operations. Yarn inventory includes all yarn that has been spun but not yet woven into cloth on the looms. The third work-in-process account includes all other operations except the three which are included in yarn manufacturing inventory. The wool preparation operations, by the way, are not carried in a work-in-process account, since entries are made directly from one raw material account to another following the preparation of the work sheet for scouring costs (or stock dye costs) as mentioned previously.

To compute the percentage of raw material content in Yarn Manufacturing Inventory, we divide the budgeted amount of wool by the sum of the following budgeted amounts:

1. Wool
2. Wool oil (used in picking)
3. Picking labor and burden
4. One-half carding labor and burden

The entire amount of picking labor and burden is used because the wool is not charged to this inventory account until it is picked. One-half the carding cost is used on the arbitrary assumption that the work on the wool in the inventory account is half completed. Spinning costs are excluded since such costs are absorbed on the basis of spinning production, with the standard cost of spun yarn being transferred monthly to yarn inventory. Therefore, neither finished yarns nor any part of spinning costs are represented in yarn manufacturing inventory account on the general ledger.

The percentage of raw material in yarn inventory is obtained by dividing the budgeted amount of wool by the total cost of picking, carding, and spinning, including wool. The determination for Blanket and Cloth Manufacturing Inventory is made in a manner similar to that for yarn manufacturing inventory. The entire costs of the first operations (warping and weaving) are included in the computation, while the costs of the final department (blanket room and cloth finishing) are excluded. Intermediate departmental costs are included on a one-half basis.

Once the raw material content percentages are calculated they are used at the end of each month for the standard budget period to determine the raw material content of each of the three work-in-process accounts and of finished goods.

Disposition of the Variances

The raw material content of the process and finished goods inventories is then compared with the standard blend cost of wool picked in the current and prior months and is allocated to these months on a first-in, first-out basis. The relationship of that portion of the raw material content of the inventories to the standard blend cost of wool picked, for each of the months involved in the inventory, determines the amount of price variances of each such month which should be retained in the reserve account as being applicable to the inventory. The remaining price variances are, of course, applicable to shipments and are cleared from the reserve account monthly by credit to cost of sales.

Exhibit 3 presents the type of work sheet used by North Star for determining the amount of price variances applicable to inventory and to cost of sales. Hypothetical figures for two months are shown to illustrate variations in the size of the inventory as related to monthly wool usage, and also, to show how unfavorable variances, denoted by red figures (in brackets), are handled when and if they occur. It will be noted that at the end of each month the balances in the reserve account represent the relationship of raw material content of the inventory to wool used in picking as shown on the left hand side of the work sheet. Thus the January 31 balance of $23,300.24 equals 100 per cent of January variances or $18,725.10 plus 30 per cent of January 1 balance of $15,250.50, or $4,575.14; February 28 balance of $9,025.11 equals 90 per cent of February variances of $10,027.90.

DISPOSITION OF PRICE VARIANCES

1946

	Wool Used in Picking	*Per cent*	*Raw Mat'l Content of Inventory*		*Price Variance* *Total*	*Regular Blankets*	*Contract Blankets*	*Cloth*
Inventory Jan. 1..			$400,000	Balance Jan. 1	$15,250.50	$ 8,125.05	$3,020.30	$4,105.15
JANUARY				January variances	18,725.10	10,550.20	4,125.30	4,049.60
January	$300,000	100.00	300,000	Total	$33,975.60	$18,675.25	$7,145.60	$8,154.75
Inventory Jan. 1	400,000	30.00	120,000	Applied to cost of sales:				
			$420,000	From Inventory Jan. 1— 70%	$10,675.36	$ 5,687.54	$2,114.21	$2,873.61
				Balance January 31	$23,300.24	$12,987.71	$5,031.39	$5,281.14
FEBRUARY								
February	360,000	90.00	$324,000	February variances	10,027.90	9,106.25	2,007.50	[1,085.85]
				Total	$33,328.14	$22,093.96	$7,038.89	$4,195.29
				Applied to cost of sales:				
				From Inventory Jan. 1— balance	$ 4,575.14	$ 2,437.51	$ 906.09	$1,231.54
				From January—100%....	18,725.10	10,550.20	4,125.30	4,049.60
				From February—10%....	1,002.79	910.63	200.75	[108.59]
				Total applied	$24,303.03	$13,898.34	$5,232.14	$5,172.55
				Balance February 28.....	$ 9,025.11	$ 8,195.62	$1,806.75	$ 977.26

(Brackets denote red figures)

EXHIBIT 3

To avoid complications in handling the percentages are applied uniformly to each of the three merchandise classifications. In cases where the relative volume of goods in each of these merchandise classifications in the inventories and in shipments changes materially, the amount of price variances calculated to be applicable to shipments by classifications may not be exactly relative to the respective shipments. However, any such monthly inaccuracies would be equalized in the cumulative figures.

Revision of Standards

Reserve figures are carried from the year end to the new year without change unless there is a revision in standard blend cost, in which case it is necessary to revise the reserve in accordance with the amount of change in standards. This is determined by repricing, at the new standards, the wool usage of the month or months representing approximately the amount of the raw material content of the closing inventory, and applying this relationship to determine the equivalent raw material content of the inventory on the basis of the new standards. The difference between the two raw material content figures is the amount by which the price variance reserve should be adjusted. For example, if the closing inventory at December 31 reflected a raw material content at the old standards of $500,000 and wool usage for December amounted to $300,000, and for November $300,000, we would reprice both months' usage at the new standards. If the total of the new extensions for both months amounted to $660,000, it would indicate that the new standards are 10 per cent higher, on the average, than the old ones. Applying this 10 per cent to the old raw material content of $500,000, we obtain an increase in standards applicable to the inventory of $50,000. This figure would be added to the closing balance of the price variance reserve to obtain the amount of such reserve to be carried forward into the new year.

CONTROL OF MAINTENANCE COSTS

by FREDERICK E. OAKHILL,
Vice President in charge of Manufacturing,
O'Cedar Corp., Chicago, Ill.

THE PROBLEM of the control of maintenance costs looms large in any industrial plant whether it is highly mechanized or not. However, before the problem can be solved one must first make an approach, and unless this approach is backed up by top management's desire to lick the problem, to encourage the solution of the problem, and to direct the undertaking, the subject becomes academic rather than practical.

Maintenance costs are not a question of original costs, but of upkeep. A properly planned approach can keep down these upkeep costs. Therefore, it becomes a matter of mechanics for setting up a proper accounting procedure to assist in securing the control desired. Accounting is generally a means for gathering statistical data for the record, but by making it a dynamic function it can be set up to control operations. This managerial type of accounting enables a manager to keep his hands on the pulse of a business and prepare to act quickly wherever and whenever such action becomes necessary.

Accountants in many cases are far more interested in figures than in facts, and such an attitude leans so heavily to the statistical phase of accounting that the managerial phase is completely pushed out of the picture to the detriment of the organization as a whole. Yet by simple means and procedures it is possible to formulate a proper system for gathering facts that will enable the manager of a business or section of a business to control the activities under his supervision. This would seem to indicate the need of an organization to perform the activities required in conducting the various operations of the business. The proper integration of this organization and the smoothness of coordination between the correlated parts will determine the over-all efficiency of the activities.

Objective of Plant Maintenance

Any business whose operations require mechanical facilities will find plant engineering and maintenance important. However, before an attempt to control activities can be put into effect it becomes necessary to establish the goal to be reached. The goal

that may be established for the plant engineering and maintenance departments may be stated as follows: "No loss of production hours due to mechanical breakdowns and a maintenance cost at the irreducible minimum." This goal represents an ideal that can never be reached even in the best of regulated and controlled companies. However, in many companies the spread between the ideal and the actual is far too great and effort spent to narrow the distance between them generally pays enormous profits. Any major activity that logically divides itself into functional activities is generally more easily supervised when like activities are segregated into group action. For example, it is best to have all the electrical work performed by an electrical department or crew, all pipe work by a pipe crew, and all millwright work performed by the millwrights. It is possible thereby to gain the advantages of the division of labor and the specialization of labor.

Maintenance Organization

The immediate problem involves the activities of three major groups:

1. The plant engineering function, which is a thinking function and which endeavors to foresee future needs and improvements.
2. The plant maintenance function, which is the doing function and which endeavors to maintain the plant and its equipment as near to its original status as possible, constantly keeping in mind the economical factors involved.
3. The accounting function, which is a control function and which endeavors to gather proper data promptly for the exercise of managerial control and in such a manner that the same data may later become statistical information.

In laying out an organization it becomes necessary to define the span of responsibilities and the span of authority of the various units within an organization. The responsibilities and authorities of the three main component parts of our problem may be defined generally as follows:

1. Plant engineering should be responsible for all engineering and development work pertaining to plant structures and equipment and the head of this group shall have authority to act within such limits that the responsibility may be properly exercised.

2. Plant maintenance should be responsible for keeping in operating condition plant structures and equipment within a set or budgeted amount and shall have authority to act within the limits set by the definition of its responsibilities and budgeted activities.
3. Accounting should be responsible for keeping the record of accomplishment and *reporting promptly* the status of actual versus budgeted or estimated expenditures before it is too late to do anything about the situation.

After such an organization has been laid out and the span of responsibilities and authorities of the component parts defined, it then becomes necessary to develop means of correlating their activities and of compiling control performance data so that the entire organization may function as a team with a common objective. This situation requires clean-cut methods of procedure for initiating maintenance work and controlling it from start to finish. These procedures should be as simple as possible and as direct in their effects as possible and of course under no condition should the system require an expenditure of effort greater than the results obtained. This condition automatically imposes limitations upon any system we should develop and adopt.

The Budget Order

One of the simplest devices that can be used for accounting control of maintenance costs is a budget or job procedure, which, of course, is only part of the requirements for the effective control of expenditures and activities. The prepared budget order automatically presupposes a knowledge of requirements, probable expenditures, and authority to carry out the proposed activities.

The budget order is initiated by a request from one in authority to charge an expenditure against a given burden center. After the request is made the amount of the probable expenditure then determines the future course of the request. For example, a request costing less than $25 to complete would be performed upon the authority of the request only. Any request that would cost more than $25 to complete would require additional authority for the expenditure, and these jobs costing more than $25 would then be controlled by a budget order.

The budget order title will define the work wanted, will list in detail the estimated expenditures, will show the proper approvals

for the expenditures and will indicate the probable date of completion.

Control of Maintenance Activities

Maintenance activities require the physical performance of specific tasks. Therefore plant maintenance, the doing function, requires accomplishment of work to carry out the imposed responsibility and the accomplishment of the given work. If it is to be done economically, it requires performance to be in accordance with a plan well worked out, and proper and adequate personnel to do the work so planned.

Plans are generally based upon the means at one's disposal. Therefore, a properly correlated organization equipped with proper and adequate procedures and facilities becomes an economic necessity. Also, the building of an organization for the accomplishment of specific tasks generally is based upon motivating policies. Naturally the motivating policies of an organization are determined by the type of industry and volume of manufacture. However, the better these policies are formulated the sounder the organization should be. From a maintenance standpoint, a preventive program based upon periodic inspections generally is more conducive of economic results than corrective maintenance done out of necessity as machines break down. Also, the thinking function, or plant engineering, should control the doing function, or plant maintenance. This involves the segregation of craftsmen into groups where they will perform functional duties, such as the electrician doing the electrical work, the pipe-fitter doing pipe work only, etc. This is generally more productive and yields more efficient results than where an attempt is made to have the craftsmen perform a multiplicity of tasks requiring different skills. The division and specialization of labor is just as effective in maintenance work as it is in mass production manufacturing activities.

Accounting Control of Maintenance

Considering the above broad aspects of maintenance activities in an organization, it becomes clear that simple but adequate records and supervisory control to keep the work within the limits of approved plans is a necessity. The accounting control of maintenance can begin to bear directly upon the activities at this point.

However, to control something one must first identify what is to

be controlled. This requires the segregation of expenses into logical categories. This segregation may be made into three parts:

1. Routine expenses which subdivide into fixed expenses and variable items of expense dependent upon productivity and accelerated usage.
2. Unusual expenses. These also divide into fixed and variable items.
3. Capital expenditures.

The routine expenses are those expenses which occur often enough in the accounting period to become a regular charge against the business. Unusual expenses are those expenses which occur infrequently and because of their nature are not a regular charge against the operations of the business. Capital expenditures are those which enhance the value of the plant properties.

Likewise, before one may control, there must be limits beyond which expenditures cannot go and this presupposes a knowledge and understanding of requirements and the establishment of a working budget. A knowledge or understanding of requirements can be gained from periodic inspections which will indicate what is needed and permit fairly accurate anticipation of maintenance requirements. Also, the various fixed operations within a plant, such as janitor work, elevator operations, window cleaning, etc., are jobs that within broad limits are usually fixed with regard to activities and expenditures. Then there are those operations which vary in proportion to the manufacturing activities, and it is these requirements that may cause a maintenance budget to go "haywire" because the accelerated usage of machinery has a very marked effect upon its useful life and maintenance requirements. This is also true of the other equipment, particularly where the original plans were predicated on a normal eight-hour day, five- or six-day week usage, and then accelerated to a round-the-clock seven-day week program. Under these conditions preventive maintenance becomes an economical and beneficial undertaking.

Comparison of Actual and Budgeted Charges

The establishment of a working budget requires a very thorough and current knowledge of the physical condition of the plant equipment and the probable program under which this equipment will be operated during the time interval covered in the budget. The foregoing indicates a very close cooperation between the plant

engineering and maintenance departments and the accounting department. Each supplements the other's contribution in arriving at a budget that is workable.

Again, to control any activity one must constantly compare an actual happening to a standard and this means that a constant comparison must be made of the actual versus estimated expenses, with a prompt showing of the "score card" to all concerned. Likewise, it becomes the responsibility of all concerned to explain any large degree of variation between the actual and estimated expenses for any specific job.

Conclusion

Summarizing, it might be said that plant engineering and maintenance involve the handling of many small details which individually are of little import, but collectively assert a tremendous influence on the over-all productive capacity of any manufacturing plant. A constant ascertaining of what needs to be done and a careful watch on what is being done will determine the net efficiency of the activities. We all know that equipment wears out faster under accelerated use; we also know that the things not readily seen are not generally given much consideration. For example, the buried water pipe is forgotten until it springs a leak, or the power wiring is added to until such time as it can no longer carry the load; it is these things that must be constantly watched. Preventive maintenance with adequate accounting control is one of the surest ways of avoiding the pitfalls so commonly experienced in many industrial plants. Best results require cooperation among the three groups. Accounting contributes its share by promptly keeping the score up-to-date and informing all concerned; engineering does the prethinking, and direct supervision does the on-the-job controlling. Preventive maintenance and correlated accounting can do much to anticipate and control further expenditures.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of N. A. C. A. Bulletin, published semimonthly at New York, N. Y., for Oct. 1, 1946, State of New York, County of New York ss.

Before me a Notary Public in and for the State and county aforesaid, personally appeared R. P. Marple, who, having been duly sworn according to law, deposes and says that he is the Editor of the N. A. C. A. Bulletin and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in Section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, National Association of Cost Accountants, 385 Madison Ave., New York 17, N. Y. Editor, R. P. Marple, 385 Madison Ave., New York 17, N. Y. Managing Editor, none. Business Manager, Wyman P. Fiske, 385 Madison Ave., New York 17, N. Y.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) National Association of Cost Accountants, 385 Madison Ave., New York 17, N. Y. President, William J. Carter, Mount & Carter, 618 First National Bank Bldg., Atlanta 3, Ga. Secretary, Wyman P. Fiske, 385 Madison Ave., New York 17, N. Y. Treasurer, Philip J. Warner, The Ronald Press Co., 15 E. 26th St., New York 10, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the twelve months preceding the date shown above is.....(This information is required from daily publications only.)

R. P. MARPLE,
Editor.

Sworn to and subscribed before me this 18th day of September, 1946.
(Seal)

IRVING I. STEINHOLTZ,
Notary Public, New York County,
N. Y. Co. Clk's No. 728, Reg. No. 939-S-6.
Commission Expires March 30, 1948.